

Fig. 1. Distributed game environment.

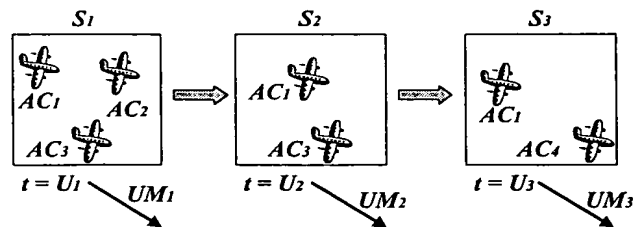


Fig. 2. Example of a state and its transitions.

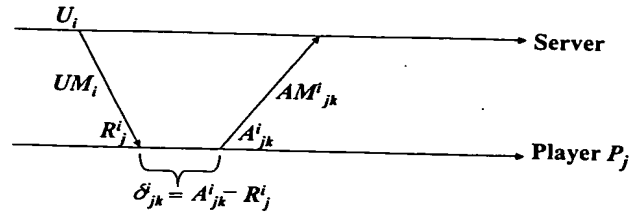


Fig. 3. Message exchange between server and players.

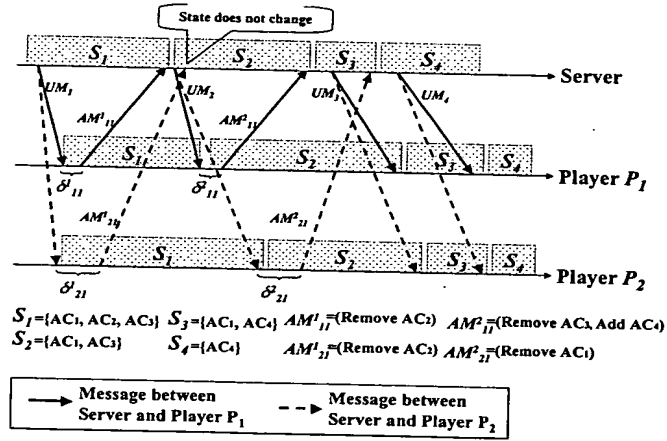


Fig. 4. Fair-order message delivery for state transitions shown in Figure 2.

Algorithm Fair-order Message Queueing(action. message M_k):

- 1: Compute $D(M_k)$ = Delivery time of M_k ;
- 2: Insert M_k into Delivery Queue sorted according to $D(M_k)$;
- 3: If (Delivery Queue Size > 1)
- 4: Recompute delivery time of existing messages;

Fig. 5. Algorithm for fair-order message queueing.

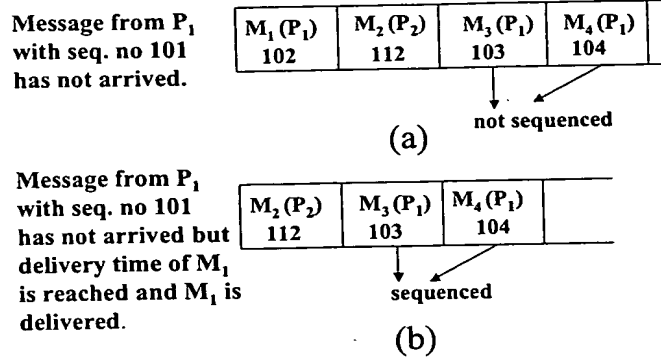


Fig. 6. Example where messages arrive after their wait timeout.

Algorithm Fair-order Message Dequeuing(action, message M_k):
 1: Delivery M_k at $D(M_k)$;
 2: If (Delivery Queue Size > 1)
 3: Recompute delivery time of existing messages;

Fig. 7. Additional algorithm for fair-order message dequeuing when messages do not arrive within their wait timeout.

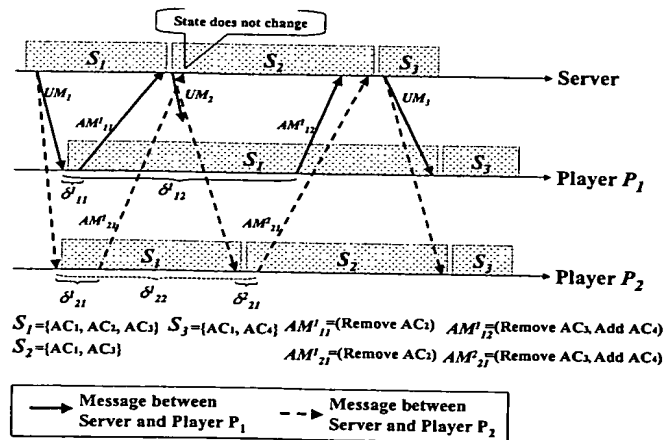


Fig. 8. Example of an inconsistent view of the game between two players, where the sequence of state changes at the server is shown in Figure 2.

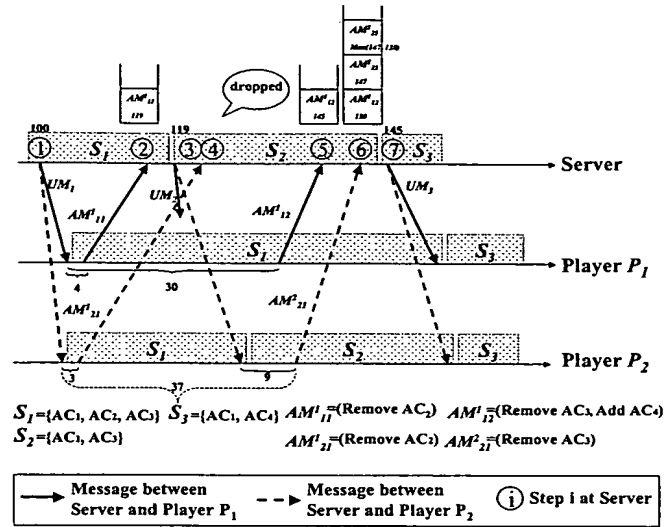


Fig. 9. Example showing the fair-order message delivery algorithm.

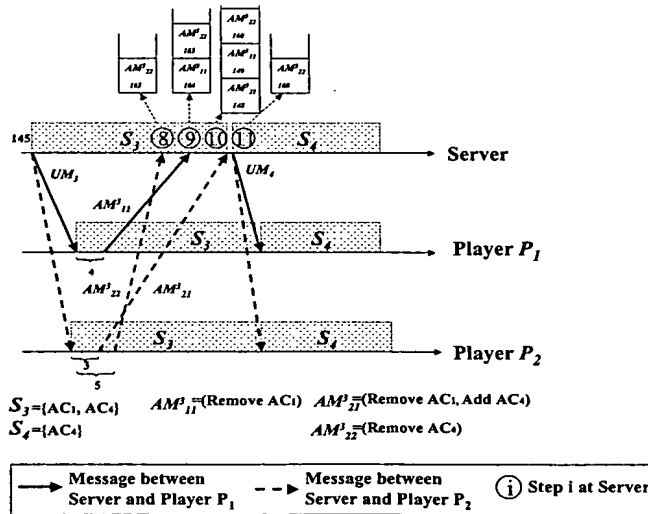


Fig. 10. Example showing the fair-order message delivery algorithm with out-of-order message reception.

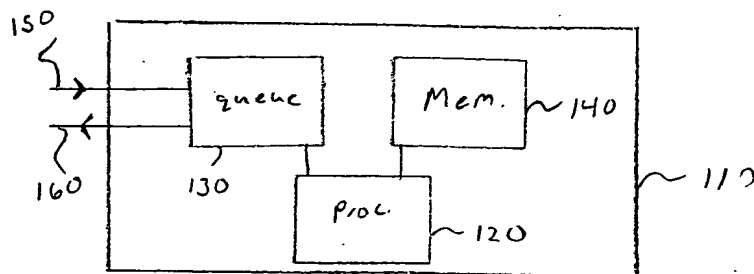


Fig. 11